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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/997,463

11/29/2001

Barry L. Carlson

1662-46400 JMH  
(P01-3705)

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02/09/2005

EXAMINER

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FORT COLLINS, CO 80527-2400

ART UNIT

PAPER NUMBER

2161

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Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 09/997,463	Applicant(s) CARLSON, BARRY L.	
	Examiner Brian Goddard	Art Unit 2161	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 January 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-24 are rejected under 35 U.S.C. 102(b) as being anticipated by the article entitled "Data Partitioning and Load Balancing in Parallel Disk Systems" by Scheuermann et al. (hereinafter 'Scheuermann')

Referring to claim 1, Scheuermann discloses a method of performing file maintenance on a plurality of storage devices as claimed. See Sections 1-3 of Scheuermann for the details of this disclosure. Scheuermann teaches "a method [load balancing algorithm (See Section 3)] of performing file maintenance on a plurality of storage devices ['disks' (See Figs. 3-4)], comprising:

(a) measuring ['Heat tracking' (See Section 3.3)] file system parameters [H - 'heat' of blocks & extents (See Sections 1-3)];

(b) determining [See Sections 1 & 3 and Step 5 of Fig. 5] periods of low disk activity [low heat (i.e. disk's queue is empty)]; and

(c) upon determination of low disk activity period [See Step 5 of Fig. 5 {also, processing is done by a background demon – a low priority thread that does not

interfere with regular disk operations (See Sections 1.2 & 3.2)), performing a file maintenance action ['Disk cooling' (See Section 3.2)] based on said system parameters; wherein (a), (b), and (c) are performed automatically [See Sections 1-3]" as claimed.

Referring to claim 2, Scheuermann teaches the method of claim 1, as above, wherein (a) includes maintaining a list of the files with the most I/O ['hot blocks' (See Sections 3.2-3.3)] as claimed.

Referring to claim 3, Scheuermann teaches the method of claim 2, as above, wherein (c) includes computing the average number of I/O cycles on the storage devices ['average disk heat' (See Fig. 5)] and moving a file from one disk to another [cooling] based on said average [See Section 3.2 & Fig. 5] as claimed.

Referring to claim 4, Scheuermann teaches the method of claim 3, as above, wherein said file is moved to the disk ['target disk'] that results in the smallest deviation from the average [See Step 5 & ¶ 3-4 of Section 3.2] as claimed.

Claim 5 is rejected on substantially the same basis as claim 2. See the discussion regarding claim 2 above, as well as the portions of Scheuermann cited therein, for the details of this disclosure.

Referring to claim 6, Scheuermann teaches the method of claim 1, as above, wherein (a) includes maintaining a fragmentation list [partition list (See Section 2 & Sections 3.1-3.2)] of files that have been fragmented [into 'extents'] as claimed.

Referring to claim 7, Scheuermann teaches the method of claim 6, as above, wherein for each fragmented file [i] in the fragmentation list, a value [SW<sub>i</sub>] is stored, said

value being representative of the ratio of the size of the fragmented file [ $L_i$ ] to the number of extents that are necessary to store the file [ $SU_i$ ] on the storage devices [See Section 2.3, Step 4a] as claimed.

Referring to claim 8, Scheuermann teaches the method of claim 7, as above, wherein (c) includes selecting for defragmentation [See Phase A & Phase B (Sections 2.1-2.2)] a fragmented file [ $i$ ] that has a lower ratio [ $P_{opt,i}$ ] than other fragmented files as claimed.

Referring to claims 9 & 10, Scheuermann teaches the method of claim 6, as above, wherein (c) includes selecting a fragmented file to be defragmented [See claim 8 above] and storing said defragmented file on a different storage device, or on the same storage device, than was used to store said fragmented file [See 'Load balancing' in Section 3] as claimed.

Referring to claim 11, Scheuermann teaches the method of claim 9, as above, wherein (c) includes determining on which storage device to store said defragmented file ['target disk'], said storage device determination including:

(c1) determining the amount of free space ['FREE' (See Section 3.1)] on each of said storage devices;

(c2) computing the average amount of free space on said storage devices [consequence of average disk heat in cooling algorithm (See Figs. 3-4)]; and

(c3) selecting the storage device on which to store said defragmented file [See Steps 3-4 of cooling algorithm]... as claimed.

Referring to claim 12, Scheuermann teaches the method of claim 1, as above, where (b) includes examining a queue of pending storage device I/O requests [See ¶ 3 of Section 3.2] to determine whether any I/O requests are pending [See Step 5 of Fig. 5] as claimed.

Claim 13 is rejected on substantially the same basis as claim 1 above. See the discussion regarding claim 1, as well as the portions of Scheuermann cited therein, for the details of this disclosure. Specifically, Scheuermann's algorithms are implemented through software stored on a computer system comprising a processor, RAM, and a plurality of storage devices [See Section 4] as claimed.

Claims 14-24 are rejected on the same basis as claims 2-12 respectively, in light of the basis for claim 13. See the discussions regarding claims 1-13 above for the details of this disclosure.

### ***Conclusion***

2. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 6,405,284 to Bridge and U.S. Patent Application Publication No. 2002/0169827 to Ulrich et al. are both considered particularly pertinent to applicant's claimed invention.

The remaining prior art of record is considered pertinent to applicant's disclosure, and/or portions of applicant's claimed invention.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian Goddard whose telephone number is 571-272-4020. The examiner can normally be reached on M-F, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Safet Metjahic can be reached on 571-272-4023. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

bdg  
4 February 2005

  
**SAFET METJAHIC**  
**ASSISTANT PATENT EXAMINER**  
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